place, they are not algebraic functions; and, besides this, the student is unlikely to form an adequate comprehension of their purpose, or to appreciate the importance of acquiring skill in the use of his tables if he takes them up in the course of a study to which they have no application. If logarithms must needs be combined with any other branch of mathematics, their true alliance, on grounds both theoretical and practical, is not with algebra but with trigonometry." In point of fact, logarithms are usually included in works on trigonometry; and we can see no reason why their principle should not also be explained, as at present, in treatises on algebra, to which the theory does really belong. Ordinary students of mathematics never learn to use logarithms properly, not so much owing to deficiency of explanation in the existing works as to the fact that they never meet in the course of their reading with anything requiring such a knowledge. Prof. Peirce's work contains 82 small octavo pages, and is intended for readers possessed of only a very trifling knowledge of algebra. It is simply what a chapter on logarithms in an ordinary algebra would become if printed separately, with the addition of copious examples and an appendix on their use in trigonometry. To show how limited is the range of the book, it is only necessary to state that all the rules have reference merely to three and four figure tables, and that the natural base *e* is not even alluded to, though it is stated that a chapter on the Napierian system will be added in another edition. There is little either to commend or blame in the book. It is partly intended for the entrance examination at Harvard, but it seems to us it would be most useful to computers who wished to obtain some notion of the reason for the rules they were in the habit of employing. In one respect the book is in advance of the time, viz., some paragraphs are devoted to the history of the subject. We believe the day will come when no scientific treatise will be considered complete that does not contain short historical notices relative to the discovery of the principal results.

Prof. Peirce defines the arithmetical complement as the complement from 10; we should much prefer to see it defined as the complement from zero, so that the arithmetical complement of a logarithm of a number should be the logarithm of the reciprocal of the number, viz. its cologarithm. We also hope the day will come when the addition of 10 to the mantissæ in our logarithmic trigonometrical canons will be abandoned, and the true negative characteristics printed and used. A complete seven-figure table with negative mantissæ was published at Paris by M. J. Dupuis in 1868, which was a step in this direction.

PEDIGREE AND RELATIONSHIP OF MAN

The Story of the Earth and Man. By J. W. Dawson, LL.D., F.R.S. (Hodder and Stoughton.)

Man and Apes. By St. George Mivart. (Hardwicke.)

THESE two works possess some points in common. Neither of their authors accept Darwinism in its entirety, the former absolutely rejecting it. They both treat of the relations of man to the lower animals, and both find the chasm of the human mental and moral phenomena the great drawback against bringing man into the same category with the apes. The manner in which the subject is treated, and the facts employed, are however not the same, while the results arrived at are very different, as will be seen from the following remarks.

Dr. Dawson is very much irritated by the manner in which many of the biologists of the present day, without feeling any necessity for giving the reasons for their belief, are in the habit of writing and talking as if the evolution hypothesis were fully proved, and established as a fundamental principle of nature. "That in our day a system destitute of any shadow of proof, and supported merely by vague analogies and figures of speech, and by the arbitrary and artificial coherence of its own parts, should be accepted as a philosophy, and should find able adherents to string upon its thread of hypotheses our vast and weighty stores of knowledge, is surpassingly strange,' remarks our author in a spirit which we are surprised to meet in one who thinks that "in the present state of natural science in Britain this evil (of regarding geologic facts from an evolutionary point of view) is to be remedied only by providing a wider and deeper culture for our young men." In the same dogmatic and unscientific spirit all the theoretical questions which are discussed, are written for the perusal of the readers of a popular journal, and such being the case, it is hardly surprising that false notions are so common as to the direct bearing and tendency of the greatest theory of modern times.

"We need not stop to mention the usual inaccuracies as to facts" is the way in which a criticism of a paragraph in one of Mr. Herbert Spencer's works is commenced, and as might be almost predicted from so self-satisfied an author, it is in the criticism only in which the inaccuracy is to be found. On the following leaf we are astonished to learn with reference to the Ascidian, that its "resemblance to a vertebrate animal is merely analogical, altogether temporary and belonging to the young state of the creature, without affecting its adult state or its real affinities with the mollusks." The author can hardly have studied Kowalevsky's memoir on the subject, in detail.

In his anatomical structure, man, according to Mr. Dawson's distorted view, presents differences from all the apes which are at least of ordinal importance, distinctions "mainly dependent on grade or rank, and not to be broken down by obscure resemblances of internal anatomy having no relation to this point, but to physiological features of very secondary importance." When, in association with this, we are told that it is merely begging the question to say that "the fact that the human skeleton is constructed on the same principles as that of an ape or a dog, must have some connection with a common ancestry of these animals," we think it hardly necessary to make further comment on the work in question, except to hope that it will not fall into the hands of commencing biological students, who would find it difficult to shake off the false associations that, in it, surround the facts which are discussed.

Mr. Mivart treats his subject in a very different manner. His object is "to investigate by the unimpassioned process of enumeration and weighing facts of structure, what is the teaching of Nature as to the affinities of various apes to man." In doing this, after a rapid review of the clasification of Mammalia generally, and the geographical distribution of the apes and lemurs, or half

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apes, as they are termed, the peculiarities of the osteology of the Primates, and their soft-part anatomy, are entered into in detail. From the facts thus obtained, especially from the peculiarities of the liver and brain, it is shown that the, at present accepted, notion that the Gorilla is man's nearest ally, is not borne out by anatomical investigation, and that the Chimpanzee, the Orang, or the Gibbon can either of them claim a closer relationship. The recapitulation of the many different points in which man in some one or other point resembles the various higher and lower apes, leads the author to think that the laws of affinity form a "network" or "tangled web" rather than a "ladder," from which it is only possible to infer that in the course of development there has been blood relationship established between the different species of apes, after their differentiation into distinct species, which is hardly compatible with our notions of the definition of a species. No decided opinion is given as to which ape does stand nearest to man, the various points of similarity in each being considered as fairly balanced. However, there are two structural features at least that are not mentioned, which, when added to those noted, go strongly to support the placing of the Orang-Utang, as the nearest ally to the human race. The first of these is an osteological one; in man and the orang the postero-internal angles of the orbital plates of the frontal bone do not meet and blend behind the cribriform plate of the ethmoid bone, as they do in the gorilla and chimpanzee. The second is in the soft part, the penis of the orang being very similar in general proportions to that of man, whilst in the chimpanzee at least, it is decidedly different, being smaller proportionately, and with a button-shaped glans.

Mr. Mivart adds the weight of Gratiolet's bold attempt to classify the monkeys by their cerebral convolutions, to show more demonstrably that the gorilla is anything but as high as he has been placed in the scale. Though Gratiolet may have been correct in so displacing the gorilla, nevertheless it is difficult to believe from their general appearance, structure, and geographical range, that, as he thought, the baboons and cercopitheci are far separate from one another, that the Asiatic true macaques and the African chimpanzee, are most closely allied; and that the affinities between the Entellus monkey and the orang are very intimate. These somewhat shake our faith in the results that have as yet been arrived at from the study of the cerebral convolutions.

No animal seems more difficult to depict correctly than the monkey, man alone excepted, which may in itself be considered to indicate a point of affinity; the illustrations accompanying Mr. Mivart's work, are, however, of the poorest description, many not being the least worthy of their author; old, and imperfect, inaccurate in not in any way giving the expressions or correct attitudes of the originals, we should have preferred to see them omitted.

OUR BOOK SHELF

Geology. By Prof. Geikie. Science Primers. (Macmillan and Co. 1873.)

THIS is a charming little book of 128 pages. It is well arranged, well written, and well illustrated, and is thoroughly well adapted for its purpose. Of course the geology in it is unexceptionable, and therefore it follows that the only thing with which a reviewer can quarrel at all is the selection of subjects for omission. Among small omissions he might mention that of Darwin's theory of coral islands as a "proof that a part of the crust of the earth has sunk down." This is so beautiful an instance of an explanation of the curious phenomena of coral islands, that it never fails to interest boys. To lead them up to this theory, and then test it as Darwin tested it, is an excellent exercise in that peculiar kind of reasoning about past causation which is of the essence of geology. A greater omission is perhaps that of the history of geological science. A sketch of this in half a dozen pages would greatly interest boys; it would show them how science grows; and they would infer that geology is not yet completely mastered, but that there is something left for them to do. It strikes one also as an omission, of a very grave kind, to say nothing at all about stratigraphical geology, a few pages of it with a general description of the stratigraphical structure of England would increase the value of the book, and what is more, inspire the reader with a desire to learn more. And lastly, one cannot but desiderate some sketch of the sequence of life on the earth as the result of palæontology, for the same reasons. If all these things were put in, the book would still be small, and would really introduce the reader to the whole of geology, and excite his curiosity. J. M. W.

Jahrbuch der kais. kön. geologischen Reichsanstalt. Band xxii. Nos. 3 and 4.

IN the first of these numbers, perhaps the most interesting paper to an English geologist is one by von Theodor Fuchs, "On Peculiar disturbances in the Tertiary Formations of the Vienna Basin, and on a self-evident Movement of Unconsolidated Earth-masses," which is accompanied by a number of illustrations and sketch sections, taken chiefly from the cuttings of the railway at Marchegg. The writer thinks that the contortions and displacements witnessed in superficial deposits, and which have been variously accounted for—some geologists supposing them to be due to subterranean action, others to glacial action, and so forth—have been induced by causes, which have hitherto been either overlooked or treated as insufficient. His studies have led him to conclude that these superficial confusions and displacements are brought about by a movement amongst the earth-masses themselves, which, as a rule, beginning with some local slip of the beds, becomes eventually converted into a movement of the whole. The motion of the earth-masses, now rolling, now gliding, can only be compared to the flow of a mud-stream or that of a glacier. After the author's paper was written, he became aware that he had been preceded in his general conclusions by Mr. R. Mallet, whose paper in the Journal of the Dublin Geological Society ("Some Remarks on the Movements of Post-tertiary and other discontinuous Masses," vol. v. p. 121) will no doubt be known to many of our readers. It is not likely, however, that glacialists will ever be got to believe that their boulder-clays, &c., and scratched rock-surfaces have been produced by the continuous or intermittent slipping of loose material which is in daily progress around all the existing coasts. The other papers in this number are, "The Mountain-land of South Glina in Croatia," by Dr. Emil Tietze, and "On the so-called gas-shales of Nyran and their flora," by von Ottokar Feistmantel. Number 4 opens with the second part of Professor Hochstetter's interesting paper "On the Geology of the eastern parts of European Turkey." This part is accompanied by a geological map of Central Turkey, which shows the distribution of the rock-masses, while several diagram sections scattered through the paper enable us to understand more clearly their succession and relative position. Amongst primary rocks

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